

Application No. 10/605,280
Docket No. A3-1662
Amendment dated November 15, 2005
Reply to Office Action of August 16, 2005

REMARKS

In the Office Action, the Examiner reviewed claims 1-20 of the above-identified US Patent Application, with the result that the specification was objected to and all of the claims were rejected under 35 USC §102 or §103. In response, Applicant has amended the specification and claims as set forth above. More particularly:

The specification has been reviewed and amended to correct typographical errors.

Independent claims 1 and 12 have been amended to specify that the previously-recited limitation requiring that the external die (24) is forced over the tube end (16) and the mandrel (26) is simultaneously inserted through the internal passage (14) within the tube end (16) is achieved by "moving [the] external die (24) and [the] mandrel (26) in unison." Support for these amendments can be found in Applicant's specification at paragraph [0010] and Figure 1.¹

The dependent claims of claims 1 and 12 have been reviewed and

¹ According to MPEP §2163 II.A.3(a), "drawings alone may provide a 'written description' of an invention as required by [35 USC §112, first paragraph]," and "[i]n those instances where a visual representation can flesh out words, drawings may be used in the same manner and with the same limitations as the specification." (Citations omitted).

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amended as necessary for consistency with their amended parent claims.

Dependent claims 3 and 13 have been amended to require that the external die (24) is not only "reciprocable in" but is also received in the holder (22) as shown in Figures 1 and 2, and to further require that the holder (22), the external die (24), and the mandrel (26) move in unison during the moving step as shown in Figure 1 and described in Applicant's specification at paragraph [0010].

Dependent claims 4 and 14 have been amended to more correctly recite a process limitation of the claimed process as opposed to a structural limitation of the apparatus used in the claimed process.

Dependent claims 5 and 15 have been amended to require that the mandrel (26) moves in unison with the bore (32) of the external die (24) during the moving step, but reciprocates within the bore (32) during the withdrawing step. Support for these amendments is found in Figures 1 and 2 and Applicant's specification at paragraphs [0010] and [0012].

Applicant believes that the above amendments do not present new matter. Favorable reconsideration and allowance of claims 1-20 are respectfully requested in view of the above amendments and the following remarks.

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Objection to the Specification

The Examiner objected to the disclosure for containing a typographical error at paragraph 14 (paragraph [0013] in Applicant's copy of his electronically filed application).² In response, and as discussed above, Applicant has amended the specification to correct the informalities at the cited location, as well as two additional errors found by Applicant.

Rejection under 35 USC §102

Independent claim 1 and dependent claims 2-9 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 4,457,157 to Masaki et al. (Masaki). Applicant respectfully requests reconsideration of this rejection in view of the amendments presented above as well as the following comments.

Applicant's amended independent claim 1 recites a process of forming an end (16) of a tube (10) having at least one internal surface feature (12) on an internal circumference (14) of the tube (10) and projecting into an

² Because the USPTO authoring software (not Applicant) automatically placed the paragraph numbers in Applicant's electronically-filed application, Applicant believes the Examiner's and Applicant's copies of the application should be identically numbered. To avoid confusion, all references to paragraphs in the application will cite the paragraph number on Applicant's copy of the electronically-filed application.

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internal passage defined by the tube (10). The process requires the step of

moving an external die [24] and a mandrel [26] in unison so as to force the external die [24] over the end [16] of the tube [10] and simultaneously insert the mandrel [26] through the internal passage within the end [16] of the tube [10], the external die [24] reducing the outer diameter of the end [16] of the tube [10] so as to define a reduced-diameter portion at the end [16] of the tube [10], the mandrel [26] being positioned farther into the internal passage than the reduced-diameter portion of the tube [10]; and then while the end of the tube [10] remains within the external die [24], withdrawing the mandrel [26] from the internal passage and through the reduced-diameter portion of the tube [10] to eliminate at least a portion of the internal surface feature [12].

Masaki discloses processes for forming an end of a tube (pipe) W, including a reduction process illustrated in Figures 6-10. In the latter, Masaki employs a cylinder piston device 1 having an external die 60 to reduce the outer diameter of the tube W and a mandrel (punch) 61 that "performs an ironing operation" (column 6, line 66). However, Masaki's process does not comprise eliminating an internal surface feature that projects into the internal passage of Masaki's tube W. Instead, Masaki's mandrel 61 is only described as "relieving any stresses that may have been set up in it, and any spring-back effect that may exist therein, by a process of plastic deformation" (column 6, line 57-column 7, line 2).

Furthermore, Masaki's process does not entail moving the external

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die 60 and mandrel 61 in unison so as to force the external die 60 over the end of the tube W and simultaneously insert the mandrel 61 through the internal passage within the end of the tube W. Instead, Masaki's process entails inserting the mandrel 61 into the end of the tube W (Figure 7), and then forcing the external die 60 over the end of the tube W (Figure 8). The basis for this two-step operation is that Masaki's external die 60 and mandrel 61 are actuated by two entirely separate piston members 6 and 31, respectively. See Masaki at column 5, line 57-column 6, line 47, and Masaki's Figure 6.

Masaki also fails to disclose the following limitations of Applicant's dependent claims 2-9:

Claim 2: "the portion of the internal surface feature [12] is eliminated by deformation without physically removing from the tube [10] the material defining the internal surface feature [12]."

Claim 3: "the holder [22], the external die [24], and the mandrel [26] move in unison during the moving step."

Claim 4: "the mandrel [26] is attached to the holder [22] so as not to reciprocate relative to the holder [22] during the moving and withdrawing steps."

Claim 5: "the mandrel [26] moves in unison with the bore [18] during the moving step, and the mandrel [26] reciprocates within the bore [18] during the withdrawing step."

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Claim 6: "the mandrel is circumscribed by the chamfer during the moving step."

Claim 8: "the end [16] of the tube [10] remains within the external die [24] during the withdrawing step solely as a result of interference between the die [24] and the reduced-diameter portion of the tube [10]."

In view of the above, Applicant believes that Masaki does not anticipate independent claim 1 nor any of its dependent claims, and therefore respectfully requests withdrawal of the rejection under 35 USC §102.

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Rejections under 35 USC §103

Dependent claims 10 and 11 (which depend from independent claim 1), independent claim 12, and its dependent claims 13-20 were rejected under 35 USC §103(a) as being unpatentable over Masaki in view of either the Examiner's Official Notice or Japanese application 05271457 to Katsuo. Applicant respectfully requests reconsideration of each of these rejections in view of the following comments.

As explained in Applicant's remarks directed to the 35 USC §102 rejection, Applicant's process requires the step of "moving an external die [24] and a mandrel [26] in unison so as to force the external die [24] over the end [16] of the tube [10] and simultaneously insert the mandrel [26] through the internal passage within the end [16] of the tube [10]" In contrast, Masaki neither discloses nor suggests moving the external die 60 or mandrel 61 in unison and, significantly, does not disclose or suggest an apparatus that operates in this manner. As noted above, Masaki's cylinder piston device 1 operates on the basis of two separate "piston members" 6 and 31 that independently actuate the die 60 and mandrel 61. The result is a far more complex apparatus than required for Applicant's claimed process, as evident from comparing Masaki's Figure 6 to Applicant's Figures 1 and 2.

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As recited in Applicant's dependent claim 13, "the holder [22], the external die [24], and the mandrel [26] move in unison during the moving step." In contrast, Masaki neither discloses nor suggests Masaki's die 60 and mandrel 61 as moving in unison with the holder ("cylinder portion") 2 in which Masaki's die 60 is received and reciprocates. Instead, Masaki's die 60 and mandrel 61 move in succession and Masaki's holder 2 does not move at all.

As recited in Applicant's dependent claim 14, "the mandrel [26] is attached to the holder [22 in which the die 24 is received] so as not to reciprocate relative to the holder [22] during the moving and withdrawing steps." In contrast, Masaki neither discloses nor suggests Masaki's mandrel 61 as being attached to the holder 2 in which Masaki's die 60 is received and reciprocates.

As recited in Applicant's dependent claim 15, "the mandrel [26] moves in unison with the bore [18 defined by the external die 24] during the moving step, and the mandrel [26] reciprocates within the bore [18] during the withdrawing step." In contrast, Masaki neither discloses nor suggests Masaki's mandrel 61 as moving in unison with the bore 60" defined by the die 60 during movement of the die 60 onto the tube W and the mandrel 61 into the tube W. Instead, Masaki's mandrel 61 is actuated to extend outside the bore 60" during movement of the mandrel 61 into the tube W.

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As recited in Applicant's dependent claim 16, "the end [16] of the tube [10] remains within the external die [24] at the initiation of the withdrawing step solely as a result of interference between the die [24] and the reduced-diameter portion of the tube [10]." In contrast, Masaki neither discloses nor suggests relying solely on interference to retain the tube W within the die 60, but instead appears to hold the die 60 in position on the tube W with the piston member 6.

As recited in Applicant's dependent claim 17, "the mandrel [26] is circumscribed by the chamfer [34] during the moving step." In contrast, Masaki neither discloses nor suggests Masaki's mandrel 61 as being circumscribed by the chamfer 60' defined by the die 60 during movement of the mandrel 61 into the tube W. Instead, Masaki's mandrel 61 is actuated to extend outside the chamfer 60' during movement of the mandrel 61 into the tube W.

The Official Notice and Katsuo were applied as teaching or suggesting, respectively, the limitation recited in claim 10 of using multiple impacts and heat exchanger tubes with multiple internal enhancements. Applicants believe that neither the Official Notice nor Katsuo can be said to supplement the teachings of Masaki in order to arrive at Applicant's invention as recited in the pending claims. Applicant therefore respectfully requests withdrawal of the rejections to the claims under 35 USC §103(a).

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Closing

In view of the above, Applicant believes that all issues outstanding from the Office Action have been addressed, and that the claims define patentable novelty over all the references, alone or in combination, of record. It is therefore respectfully requested that this patent application be given favorable reconsideration.

Should the Examiner have any questions with respect to any matter now of record, Applicant's representative may be reached at (219) 462-4999.

Respectfully submitted,

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